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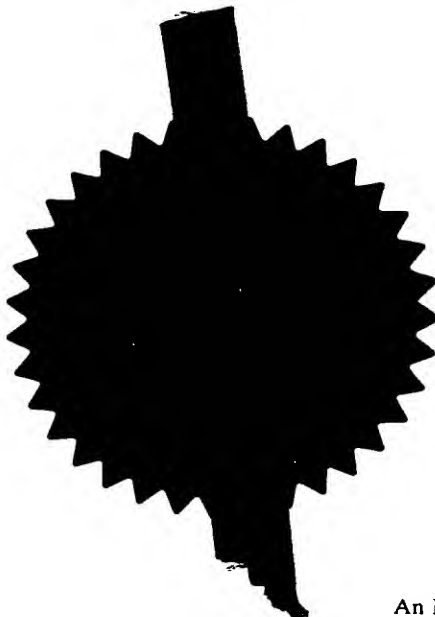
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P01/7700-25.00 - 9806924.8

# Request for grant of a patent

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The Patent Office

Cardiff Road  
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1. Your reference P32176GB

2. Patent application number (The Patent Office) 9806924.8 31 MAR 1998 31 MAR 1998

3. Full name, address and postcode of the or of each applicant. (underline all surnames) VODAFONE LIMITED  
The Courtyard, 2-4 London Road,  
Newbury, Berkshire  
RG14 1JX

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

U.K.

6227912062

4. Title of the invention CELLULAR TELEPHONE ARRANGEMENTS

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom MATHISEN, MACARA & CO, The Coach House,  
to which all correspondence should be sent 6-8 Swakeleys Road, Ickenham, Uxbridge, UB10 8BZ  
(including the postcode)

Patents ADP number (if you know it) 1073001

If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)	Date of filing (day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application	Date of filing (day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

a) any applicant named in part 3 is not an inventor, or

b) there is an inventor who is not named as an applicant, or

c) any named applicant is a corporate body

Yes

(See note (d))

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Patents Form 1/77

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Continuation sheets of this form

Description 8

Claim(s) 5

Abstract 1

Drawing(s) 5 + 5

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77) 1

Request for preliminary examination and search (Patents Form 9/77) 1

Request for substantive examination (Patents Form 10/77)

Any other documents 0  
(please specify)

11. I/We request the grant of a patent on the basis of this application.

Signature

Date

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12. Name and daytime telephone number of person to contact in the United Kingdom D M FOSTER 01895 678331

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CELLULAR TELEPHONE ARRANGEMENTS

The invention relates to cellular telephone arrangements. Cellular telephone arrangements embodying the invention, and to be described in more detail below by way of example only, are intended to provide base station and antenna arrangements for use mainly in urban environments, but may be used in other environments.

According to the invention, there is provided an item of street furniture, additionally incorporating or carrying at least part of a base station-antenna combination for a cellular telephone system.

According to the invention, there is further provided a method of increasing the coverage of a cellular telephone system, comprising the step of mounting at least part of a base station-antenna combination of the system on and/or in an item of street furniture having another and principal function.

Cellular telephone base stations and antenna arrangements embodying the invention will now be described, by way of example only, with reference to the accompanying diagrammatic drawings in which:

Figure 1 is a perspective view of one embodiment of the invention;

Figure 2 is a perspective view of another embodiment of the invention; and

Figures 3, 4 and 5 are elevational views of further embodiments.

Cellular telephone systems require a number of geographically distributed base stations each having a transmitting and receiving antenna by means of which radio signals are transmitted to and from mobile cellular telephones temporarily located within the area covered by the base station. Such signals include signals to and from the mobile telephone for registering its presence within that particular area and for use in recording that location in a visitor location register or in some other part of the system, signals for authenticating the mobile telephone to enable calls to be made to and from it, signals carrying voice, data or other digital information from the mobile telephone or other such equipment to other telephones (mobile or fixed), and signals carrying voice, data or other digital information from such other telephones to the mobile telephone or other such equipment. When the mobile telephone moves from within the transmitting/receiving area of the antenna of one base station and into the corresponding area of another base station,



the mobile is "handed over" to the new base station. To provide effective operation of a mobile telephone it is of course essential that base stations and their associated antennas be positioned sufficiently close together to provide uninterrupted operation, taking account of the local environment. In particular, problems can arise in urban environments. Firstly, large and solid buildings within an urban environment may limit the effective range of each base station, requiring the base stations to be closer together than they might be in a more open or rural environment. Secondly, local planning authorities may be very reluctant to allow a proliferation of base stations and their associated antennas within urban, suburban or rural environments.

According to a feature of the embodiments being described, therefore, at least part of a base station-antenna combination is located in and/or on an item of street furniture - such as (for example) a lamp post, a support post for close circuit television (CCTV) apparatus, posts for traffic lights, direction signs or road signs in general, shop signs, litter bins and any other suitable item of street furniture. In this way, therefore, a base station-antenna combination can be physically situated within an urban environment without having substantially any additional physical or visual effects on the environment. Thus, the item of street furniture on which the base station-antenna

combination is mounted, or in which part only of that combination is mounted, is present in the environment or is already accepted into the environment due to its appearance, and the additional visible part may only comprise the base station antenna which is small and of minimal visual impact. In many cases, the circuitry of the base station may be incorporated in an enclosure which is already part of the item of street furniture - for example, the enclosure forming the lower part of a lamp post or a CCTV post.

Figure 1 shows a lamp post comprising a mast 5 carrying a lamp unit 6 and having an enlarged enclosure 8 at its foot which will include control circuitry for the lamp unit 6 such as its power supply and a timer or possibly a photo-electric control unit. In accordance with a feature of the invention, one or more antennas 10,12 is also mounted on the mast 6, these antennas being antennas of a base station of a cellular telephone system. In this embodiment, the circuitry of the base station is mounted in an additional enclosure 14 which is positioned on the ground, adjacent the foot of the mast 5 and is connected to the antennas 10,12.

The antennas 10,12 are small in size and mounted considerably above pedestrians and traffic. They will therefore have minimal visual impact. The enclosure 14 is also small in size and of standard street furniture appearance. Because of this, and

because it is mounted immediately adjacent the foot of the lamp post mast 5, it also will have only a small physical and visual impact.

In a modification, however, the circuitry of the base station can be mounted within the enclosure 8 of the lamp post itself, instead of in a separate enclosure 14. In such a case, it may be necessary to enlarge the enclosure 8 but this may be done to an extent which is hardly noticeable.

In another modification, the enclosure 14 is not mounted immediately adjacent to the lamp post but is mounted a short distance away, such as on, in or immediately adjacent to a neighbouring building and connected to the lamp post and the antennas 10,12 via connections under the pavement or roadway. If such an enclosure 14 is mounted outside the building, it can be shaped and coloured, relative to the shape and colour of the building, so that, again, it has minimal physical or visual impact.

In Figure 2, a mast 20 for supporting a CCTV camera 22 has an enclosure 24 in which is located the control and power circuits for the camera, such as for energising and adjusting the attitude of the camera. In accordance with a feature of the invention, the mast 20 also carries an antenna 26 which is the antenna of

a cellular telephone base station. In this example, the circuitry for the base station can be located within the enclosure 24 if it is of a suitable size. Again, however, the circuitry for the base station could be incorporated within a separate enclosure located either immediately near the enclosure 24 or at some other location where its physical and visual impact is small.

In the case of the embodiment shown in Figure 2, where the enclosure 24 will incorporate circuitry of some complexity for energising and controlling the CCTV camera 22, it may advantageously be possible to arrange for at least some of the circuitry for the camera and for the base station to be common - such as the power supply and perhaps some of the processing circuitry for the signals to be transmitted to and from a distant location. The use of such common circuitry enables the size of the enclosure 24 to be reduced.

Figure 3 shows a view along a road within an urban environment, showing the road surface 30, the pavement 32, and a building 34 carrying a sign 36 such as bearing the name of a shop in the building or being some other advertising or informational sign for example. The Figure shows an enclosure 38 in which is incorporated the circuitry of a base station for a cellular telephone system. The circuitry is connected via suitably

concealed connections to an antenna 40 mounted on or in the sign 36. Again, therefore, the antenna 40 has minimal physical and visual impact or is invisible, and the enclosure 38 is designed to achieve the same end.

In an advantageous modification of the arrangement shown in Figure 3, the enclosure 38 may be located within the building so as to have no external physical or visual impact, as shown dotted at 38A.

Figure 4 shows a modification of the arrangement shown in Figure 3. In Figure 4, the antenna is shown dotted at 42, being mounted within the sign 36 and therefore completely invisible.

In the embodiments shown in Figures 5 and 6, the sign 36 is mounted flat on the front face of the building and is therefore shown in end view in these Figures. In Figure 5, the antenna is shown at 44 and is mounted externally on the sign. In Figure 6, the antenna is shown dotted at 46 and is mounted within the sign.

In the embodiments shown in Figures 3 to 6, a miniaturised version of the base station circuitry may also be incorporated in or on the sign.

It will be appreciated that many modifications can be made. In particular, and using the principles disclosed, antennas for cellular telephone base stations can be mounted on or in a variety of other types of street furniture, and either the circuitry for the base station can be also incorporated therein or a circuitry for the base station can be located at a suitable adjacent point such as outside or inside a neighbouring building.

CLAIMS

1. An item of street furniture, additionally incorporating or carrying at least part of a base station-antenna combination for a cellular telephone system.
2. An item of street furniture according to claim 1, in which the said part is an antenna.
3. An item according to claim 1 or 2, in which circuitry for the base station is incorporated in an enclosure and connected to the antenna.
4. An item of street furniture according to claim 3, in which the enclosure is adapted to be positioned separately from the item of street furniture and connected to the antenna thereon.
5. An item of street furniture according to claim 3, in which the enclosure is part of the item of street furniture.
6. An item of street furniture according to claim 5, in which the enclosure is the same enclosure which includes circuitry for use in the principal function of the item of street furniture.
7. An item of street furniture according to any one of claims

3 to 6, in which at least part of the circuitry for the base station is common with part of the circuitry for the principal function of the item of street furniture.

8. An item of street furniture according to any preceding claim, in the form of a mast carrying lighting means.

9. An item of street furniture according to any one of claims 1 to 7, comprising a mast carrying a close circuit television camera.

10. An item of street furniture according to any one of claims 1 to 7, comprising a sign.

11. An item of street furniture according to claim 10, in which the sign is a shop sign or an advertising sign.

12. An item of street furniture according to claim 10, in which the sign is a traffic sign.

13. A method of increasing the coverage and/or capacity of a cellular telephone system, comprising the step of mounting at least part of a base station-antenna combination of the system on or in an item of street furniture having another and principal function.



14. A method according to claim 13, in which the said part is an antenna.

15. A method according to claim 13 or 24, including the step of incorporating the circuitry for the base station in an enclosure and connecting it to the antenna.

16. A method according to claim 15, including the step of positioning the enclosure separately from the item of street furniture and connecting it to the antenna thereon.

17. A method according to claim 15, in which the enclosure is part of the item of street furniture.

18. A method according to claim 17, in which the enclosure is the same enclosure which includes circuitry for use in the principal function of the item of street furniture.

19. A method according to any one of claims 15 to 18, in which at least part of the circuitry for the base station is common with part of the circuitry of the item of street furniture.

20. A method according to any one of claims 13 to 19, in which the principal function is a lighting function.

21. A method according to any one of claims 13 to 20, in which the principal function is that of carrying a close circuit television camera.

22. A method according to any one of claims 13 to 20, in which the principal function is a sign function.

23. An item of street furniture incorporating or carrying at least part of a base station-antenna combination of a cellular telephone system, substantially as described with reference to Figure 1 of the accompanying drawings.

24. An item of street furniture incorporating or carrying at least part of a base station-antenna combination of a cellular telephone system, substantially as described with reference to Figure 2 of the accompanying drawings.

25. An item of street furniture incorporating or carrying at least part of a base station-antenna combination of a cellular telephone system, substantially as described with reference to Figure 3 of the accompanying drawings.

26. A method of increasing the coverage and/or capacity of a cellular telephone system, substantially as described with reference to Figure 1 of the accompanying drawings.

27. A method of increasing the coverage and/or capacity of a cellular telephone system, substantially as described with reference to Figure 2 of the accompanying drawings.

28. A method of increasing the coverage and/or capacity of a cellular telephone system, substantially as described with reference to any one of Figures 3 to 6 of the accompanying drawings.

ABSTRACT. (Figure 1)

A conventional lamp post comprises a mast (5) carrying a lamp unit (6) and with an enclosure (8) at its base, incorporating power and control circuitry for the lamp unit (6). In addition, however, one or more antennas (10,12) for the base station of a cellular telephone system is or are mounted on the mast (5). The circuitry for the base station is mounted in an enclosure (14) which is immediately adjacent to the base of the lamp post and electrically connected to the antenna (10,12). By incorporating the components of the base station on and immediately adjacent to the lamp post, a base station can be located within an urban environment and with minimal physical or visual impact. Any other suitable item of normal street furniture can be used instead of a lamp post. The circuitry of the base station can be incorporated in the item of street furniture itself, instead of in a separate enclosure (14). In suitable conditions, some of the circuitry of the base station can be common with some of the circuitry for the street furniture.

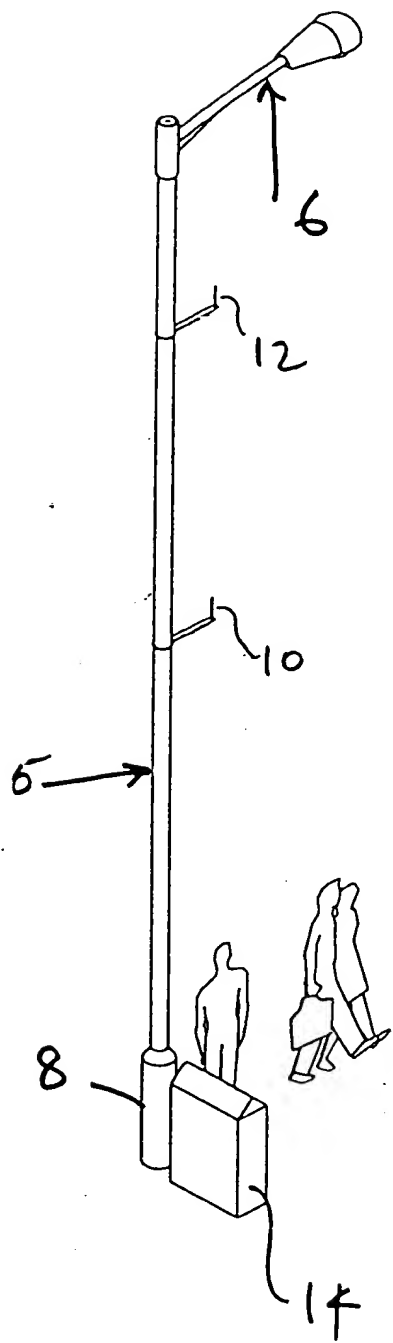


Fig. 1

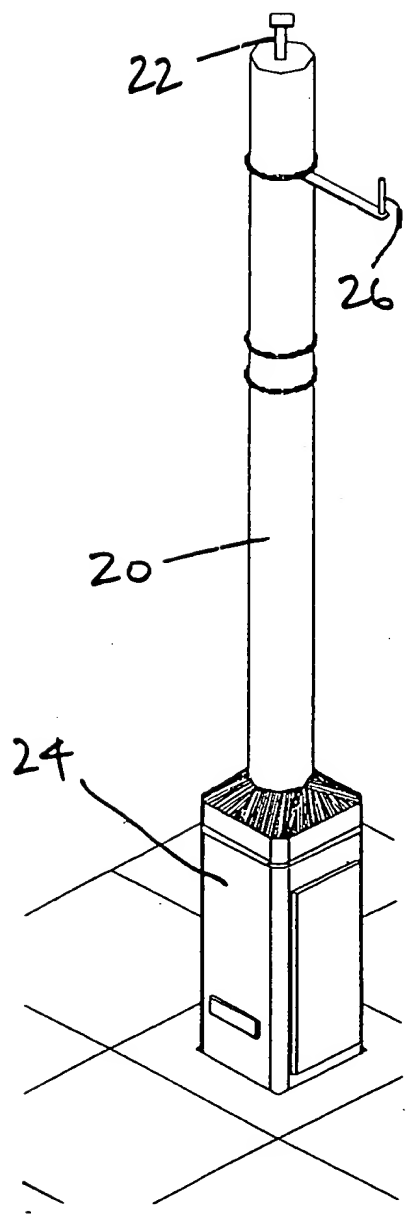


Fig. 2

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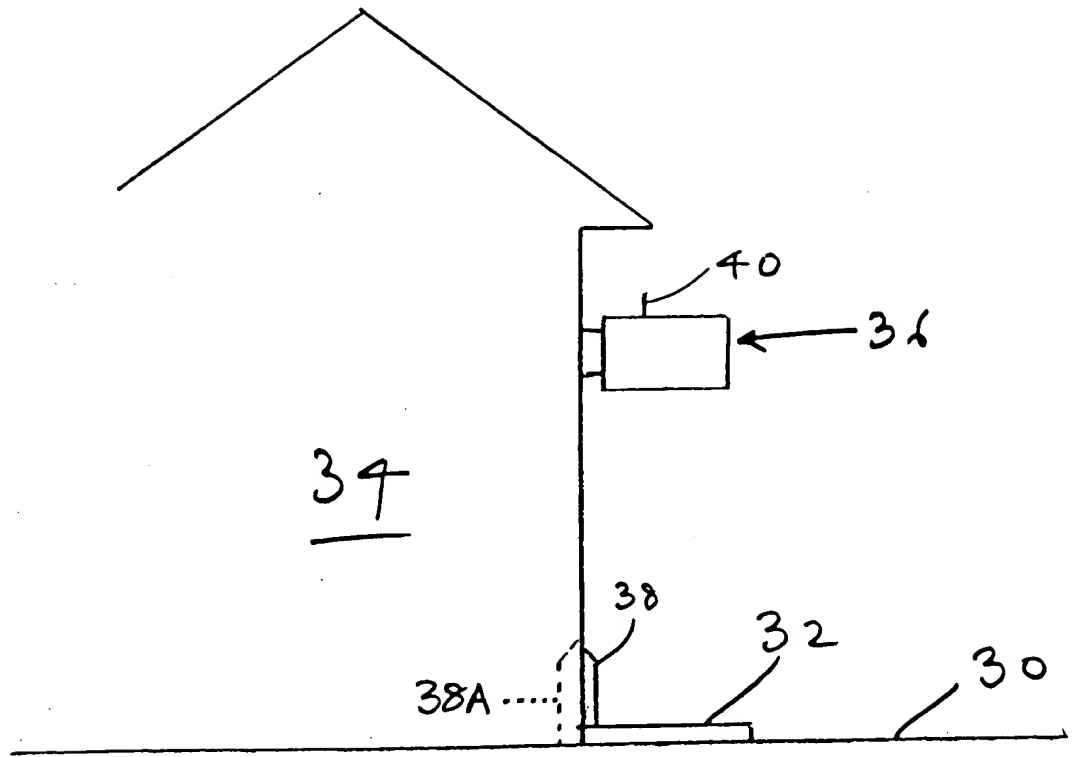


Fig. 3

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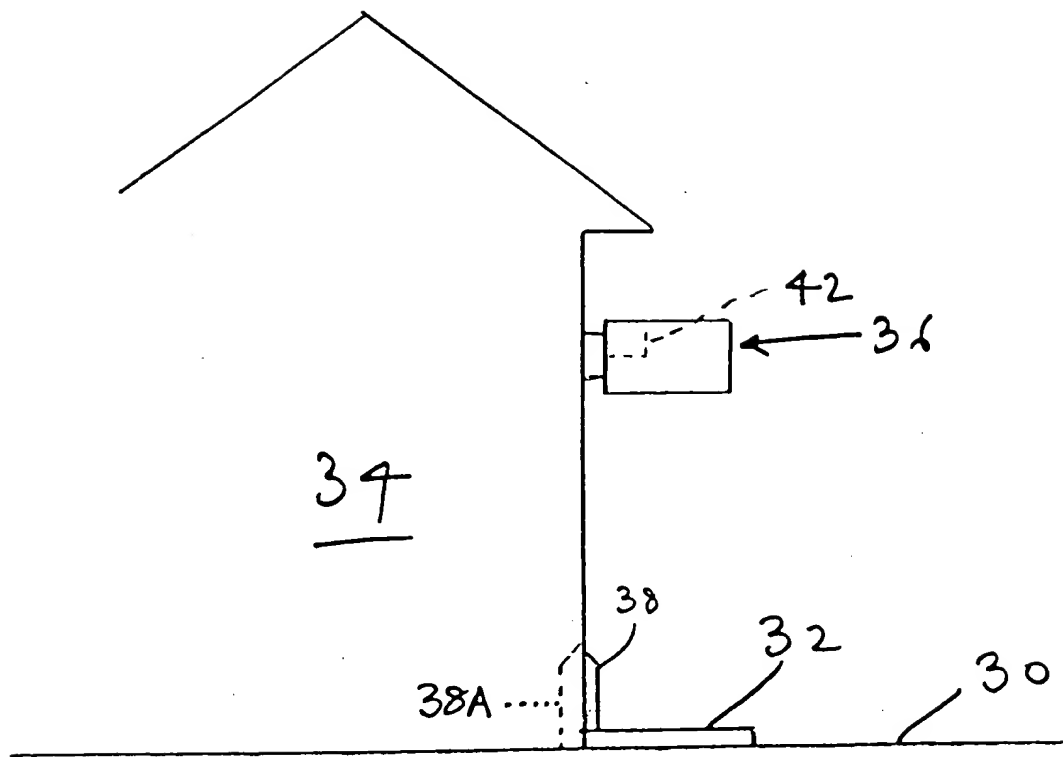


Fig. 4

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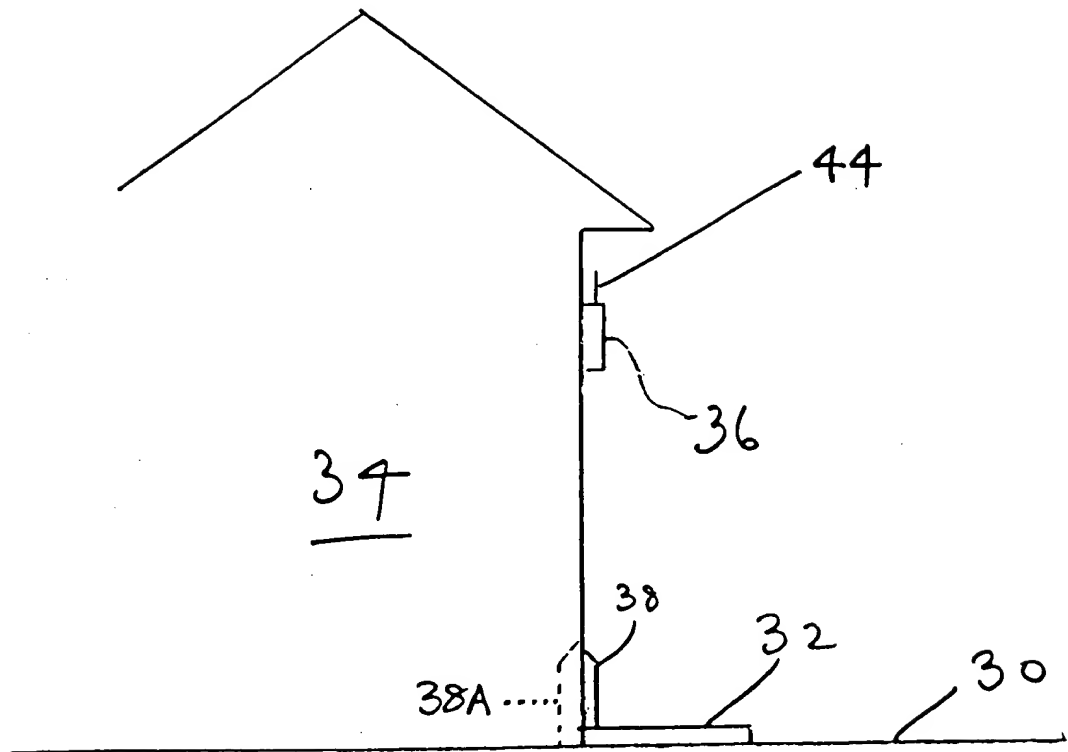


Fig. 5

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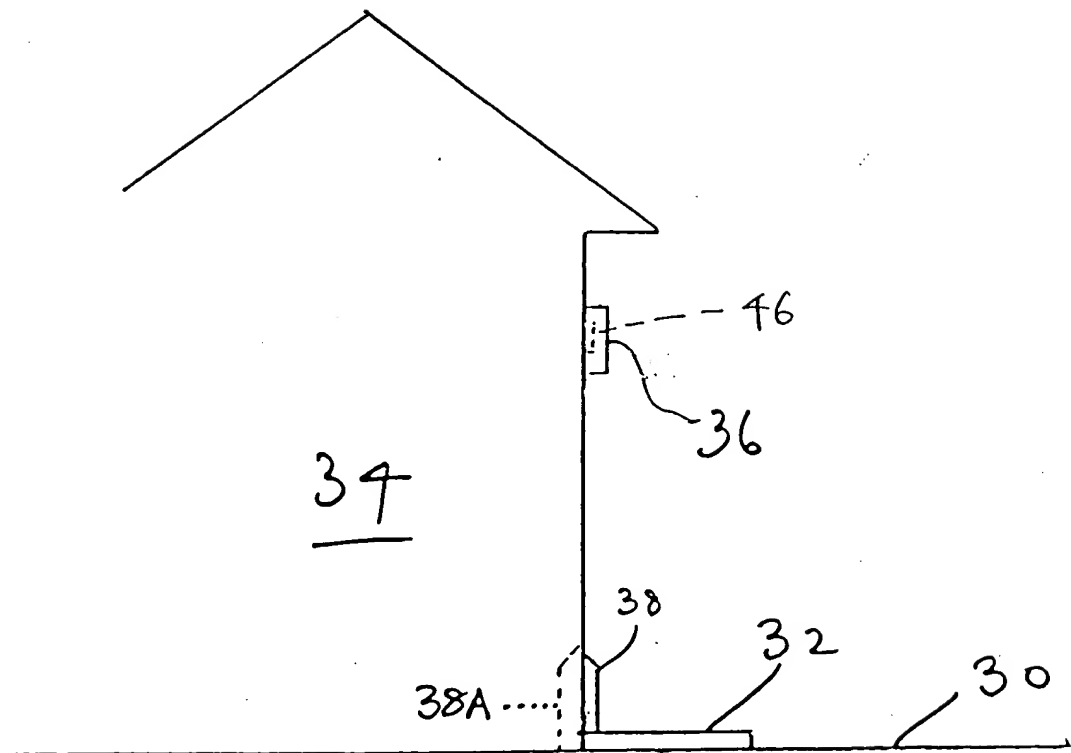


Fig. 6

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